PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-039808
(43)Date of publication of application : 10.02.1995

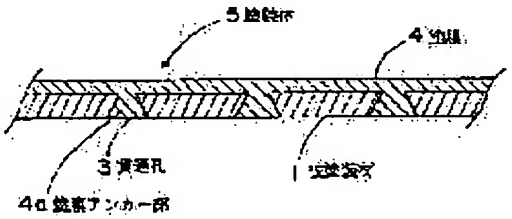
(51)Int.Cl. B05D 3/12
B05D 3/06
B05D 7/14
B23K 26/00

(21)Application number : 05-190415
(22)Date of filing : 30.07.1993

(71)Applicant : TAISEI CORP
(72)Inventor : SUGIMOTO KENJI
UIGUNARAAJIYA SHIBAKUMARAN
FUJIOKA TOMOO

(54) SUBSTRATE TREATMENT FOR COATING AS WELL AS MATERIAL TO BE COATED AND COATED BODY

(57)Abstract:
PURPOSE: To provide the method for substrate treatment of coating which enhances the adhesion property of a material to be coated and a coating film by subjecting this material to be coated to a surface treatment as well as the material which is to be coated and is subjected to such treatment and the coated body formed by coating the material to be coated.
CONSTITUTION: A metallic plate is used as the material 1 to be coated and is bored with many through holes 3 by irradiating this material with a laser. The through holes 3 are formed to 0.1 to 0.5mm diameter on the surface to be coated and to 0.1 to 0.5mm on the rear surface thereof by controlling the focus of a laser beam. The surface of the material 1 which is to be coated and is bored with the through holes 3 is washed and thereafter, the surface is coated with the coating material in such a manner that the coating material is fitted by intruding of coating film anchor parts 4 into the through holes 3 from the coating film 4 having 0.3mm film thickness, by which the coating body 5 is obtd.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平7－39808

(43)公開日　平成７年(1995)２月10日

(51)Int.Cl.[6]		識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｂ０５Ｄ	3/12		Ｄ　8720－4Ｄ		
	3/06		Ｚ　8720－4Ｄ		
	7/14		Ｇ		
Ｂ２３Ｋ	26/00	３３０			

審査請求　未請求　請求項の数13　ＯＬ　（全５頁）

(21)出願番号　特願平5－190415

(22)出願日　平成５年(1993)７月30日

(71)出願人　000206211
大成建設株式会社
東京都新宿区西新宿一丁目25番１号

(72)発明者　杉本　賢司
東京都新宿区西新宿一丁目25番１号　大成建設株式会社内

(72)発明者　ウィグナラージャ　シバクマラン
東京都新宿区西新宿一丁目25番１号　大成建設株式会社内

(72)発明者　藤岡　知夫
東京都新宿区西新宿一丁目25番１号　大成建設株式会社内

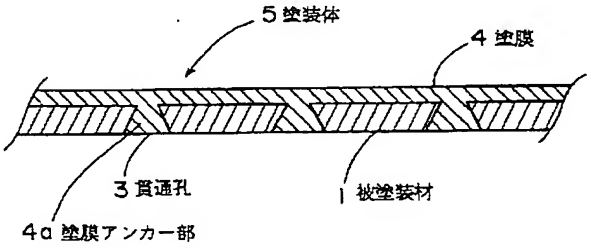
(74)代理人　弁理士　森　哲也　（外２名）

(54)【発明の名称】　塗装下地処理方法と被塗装材及び塗装体

(57)【要約】

【目的】被塗装材に下地処理を施すことにより、被塗装材と塗膜との密着性を高める塗装下地処理方法と、かかる処理を施した被塗装材と、その被塗装材に塗装を行った塗装体とを提供することを目的とする。

【構成】金属板を被塗装材１として用い、これにレーザを照射して多数の貫通孔３を開ける。この時に、レーザビームの焦点を調節して、貫通孔３は、被塗装面における直径が０．３ｍｍで、その裏面では０．４５ｍｍとする。貫通孔３を開けた被塗装体１の表面を洗浄後、塗膜４の膜厚が０．３ｍｍで、その塗膜４から貫通孔３内に塗膜アンカー部４ａが入り込んで嵌結するように塗料を塗り、塗装体５とする。



1

【特許請求の範囲】

【請求項１】　塗装を行うに先立ち、被塗装材に、直径０．１～０．５ｍｍの貫通孔を多数開けることを特徴とする塗装下地処理方法。

【請求項２】　請求項１に記載の塗装下地処理方法において、前記貫通孔を、前記被塗装材の被塗装面における直径よりも、その裏面における直径の方を大きくすることを特徴とする塗装下地処理方法。

【請求項３】　請求項１または請求項２に記載の塗装下地処理方法において、前記貫通孔は、レーザを照射して開けることを特徴とする塗装下地処理方法。

【請求項４】　請求項１、請求項２または請求項３に記載の塗装下地処理方法において、前記被塗装材の被塗装面を水平方向に配置し、前記貫通孔を被塗装材の下方から開けることを特徴とする塗装下地処理方法。

【請求項５】　請求項１または請求項２に記載の塗装下地処理方法において、前記被塗装材の被塗装面を水平方向に配置し、前記貫通孔を被塗装材の下斜め方向からのレーザ照射によって開けることを特徴とする塗装下地処理方法。

【請求項６】　請求項３、請求項４または請求項５に記載の塗装下地処理方法において、レーザビームの焦点を調節して、前記貫通孔の直径を、被塗装材の被塗装面と裏面とで変えることを特徴とする塗装下地処理方法。

【請求項７】　請求項１、請求項２、請求項３、請求項４、請求項５または請求項６に記載の塗装下地処理方法において、前記被塗装材に金属板を用いることを特徴とする塗装下地処理方法。

【請求項８】　直径０．１～０．５ｍｍの多数の貫通孔を設けたことを特徴とする被塗装材。

【請求項９】　請求項８に記載の被塗装材において、前記貫通孔は、前記被塗装材の被塗装面における直径よりも、その裏面における直径の方が大きいことを特徴とする被塗装材。

【請求項１０】　請求項８または請求項９に記載の被塗装材において、前記被塗装材は、金属板であることを特徴とする被塗装材。

【請求項１１】　直径０．１～０．５ｍｍの多数の貫通孔を設けた被塗装材と、この上に成層した塗膜と、前記塗膜から前記貫通孔内に入り込んで嵌結した塗膜アンカー部とからなる塗装体。

【請求項１２】　請求項１１に記載の塗装体において、前記貫通孔は、前記被塗装材の被塗装面における直径よりも、その裏面における直径の方が大きいことを特徴とする塗装体。

【請求項１３】　請求項１１または請求項１２に記載の塗装体において、前記被塗装材は、金属板であることを特徴とする塗装体。

【発明の詳細な説明】

【０００１】

2

【産業上の利用分野】本発明は、塗装下地処理方法と被塗装材及び塗装体とに係り、特に、被塗装材に下地処理を施すことにより、被塗装材と塗膜との密着性を高める塗装下地処理方法と、かかる処理を施した被塗装材と、その被塗装材に塗装を行った塗装体とに関する。

【０００２】

【従来の技術】たとえば、アルミニウム材質や鉄鋼材質等の金属板は、建物の外壁、屋根または自動車の外装等の広い範囲で使用されている被塗装材である。そして、かかる金属板の表面の塗装は、下地処理として金属板の表面に付着している油脂分を取り除き清掃をした後に、さらに、下塗、中塗、上塗という多くの行程を経て行なわれていた。

【０００３】そして、外装に用いる金属板では、その下地処理として、さらに、粒状の研磨材を加速噴射して被塗装面にぶつけるブラスト法やディスクサンダー（研磨ホイル）等の動力工具を使用する等の物理的方法、または、酸化促進剤を被塗装面に塗布する等の化学的方法で、その被塗装面に凹凸をつけることにより、被塗装面の表面積を増大し、また、塗膜の足がかりを付与して、被塗装材に対する塗膜の付着性を増していた。

【０００４】

【発明が解決しようとする課題】しかし、前記下地処理を行った金属板の表面に塗料を塗布した塗装体を建物の外装として用いた場合には、太陽による過酷な熱条件の繰り返しにより、金属板と塗料である樹脂との熱膨張率の違いが原因となって、塗膜が膨れたり、その剥離が生じたりしていた。

【０００５】また、太陽による熱膨張により被塗装材に歪みが生じて、塗装体の表面に映る映像を歪ませたり、夕方には、膨張していた被塗装材の収縮音が発生する等の問題があった。これは、被塗装材が金属板であるときに顕著である。そして、金属屋根に代表される瓦棒葺き屋根では、その折り曲げ部分が引っ張られるために、塗膜の剥離が生じやすかった。一方、自動車の外装として用いられる金属板では、自動車の生産行程における折り曲げ加工で塗膜が剥離する問題があり、また、意匠性を高める必要があるのみならず、燃費の効率を高めるための軽量化も図らなければならないという問題があった。

【０００６】さらに、海岸地方においては、金属板と塗料との付着性が十分でないために、塩分の付着により錆が発生しやすいという問題が生じていた。また、錆の問題は別として、このような問題は、被塗装材に、他の素材、たとえば、プラスチック材を用いる場合にも想定される。

【０００７】

【課題を解決するための手段】本発明は、前記課題を解決するために、堅牢で耐候性に優れる被塗装材、塗装体及び塗装下地処理方法を提供する。すなわち、この発明は、請求項１に記載したように、塗装を行うに先だち、

被塗装材に直径０．１～０．５mmの貫通孔を多数開けることを特徴とする塗装下地処理方法に係る。

【０００８】なお、被塗装材に開ける貫通孔の直径を０．１～０．５mmとしたのは、次に述べる理由による。建物の雨漏りは、直径０．３mm以下の孔では生じにくい。また、０．５mmの貫通孔が開いている被塗装材に、外装材としての一般的な塗装をすると、塗装後の貫通孔の直径は、０．３mm以下となる。したがって、被塗装材に開ける貫通孔の大きさを０．５mm以下とすれば、貫通孔が塗膜によって塞がれなくても雨漏りは生じない。一方、塗装前の貫通孔の直径が０．１mmより小さいと、後述する塗膜に対する貫通孔の作用効果が生じない。

【０００９】ここで、請求項２に記載したように、前記貫通孔を、前記被塗装材の被塗装面における直径よりも、その裏面における直径の方を大きくすることを特徴とすると効果的である。また、請求項３に記載したように、前記貫通孔は、レーザを照射して開けることを特徴とすると、被塗装材が例えば金属板のような場合には、貫通孔を開ける方法として好適である。

【００１０】レーザとしては、例えば、炭酸ガスレーザ、ＹＡＧレーザまたはエキシマレーザ等が適当である。そして、請求項４に記載したように、前記被塗装材の被塗装面を水平方向に配置し、前記貫通孔を被塗装材の下方から開けることを特徴とする塗装下地処理方法とすると貫通孔を開ける方法としてさらに好適である。

【００１１】さらに、請求項５に記載したように、前記被塗装材の被塗装面を水平方向に配置し、前記貫通孔を被塗装材の下斜め方向からのレーザ照射によって開けると、より好適な方法となる。また、レーザを照射して請求項２に記載したような貫通孔を開けるときは、請求項６のように、レーザビームの焦点を調節して、前記貫通孔の直径を、被塗装材の被塗装面と裏面とで変えることを特徴とする塗装下地処理方法として、レーザビームの焦点を被塗装材の表面近傍に位置させて照射すれば良い。

【００１２】これらの塗装下地処理方法は、請求項７に記載したように、前記被塗装材に金属板を用いることを特徴とすると、最適である。そして、これらの塗装下地処理方法を被塗装材に施すことにより、請求項８に記載したように、直径０．１～０．５mmの多数の貫通孔を設けたことを特徴とする被塗装材となる。

【００１３】また、請求項９に記載したように、前記貫通孔は、前記被塗装材の被塗装面における直径よりも、その裏面における直径の方が大きいことを特徴とする被塗装材とすることもできる。さらに、請求項１０に記載したように、前記被塗装材は、金属板であることを特徴とする被塗装材にもなる。

【００１４】次いで、これらの被塗装材に塗料を塗ることにより、請求項１１に記載したように、直径０．１～

０．５mmの多数の貫通孔を設けた被塗装材と、この上に成層した塗膜と、前記塗膜から前記貫通孔内に入り込んで嵌結した塗膜アンカー部とからなる塗装体となる。また、請求項１２に記載したように、前記貫通孔は、前記被塗装材の被塗装面における直径よりも、その裏面における直径の方が大きいことを特徴とする塗装体とすることもできる。

【００１５】さらに、請求項１３に記載したように、前記被塗装材は、金属板であることを特徴とする塗装体にもなる。

【００１６】

【作用】通常の場合には、塗装体の被塗装材と塗膜とは、化学的な結合によって付着性を確保しているが、本発明のように、被塗装材に直径０．１～０．５mmの貫通孔を開けることにより、塗料が被塗装材の貫通孔に充填され、それが乾燥固化して、被塗装面上の塗膜と一体の塗膜アンカー部となる。そして、被塗装材と塗膜とは、化学的に結合するだけではなく、かかる塗膜アンカー部により、物理的にも結合して一体化する。

【００１７】また、被塗装材に前記のような貫通孔を多数開けることにより、被塗装材の熱膨張または被塗装材の曲げ加工による歪みは、貫通孔の部分で吸収される。そして、貫通孔の直径を、被塗装面側は小さく、裏面側を大きくすることにより、かかる貫通孔内の塗膜アンカー部は、容易に抜けることはなくなる。次に、被塗装材に、直径０．１～０．５mmという小さな貫通孔を開ける方法として、レーザを照射することにより、たとえば、硬い金属板を被塗装材とする場合にも、所望の大きさの貫通孔を開けるのが容易となる。そして、レーザビームの焦点を調節することにより、貫通孔の直径を、被塗装面側とその裏面側とで大きさを変えることも精度良く調節できる。

【００１８】そして、レーザビームの焦点を、被塗装材の被塗装面の近傍に位置させれば、銃弾が物を突き破るときと同じ原理により、レーザが貫く孔は先に行く程大きくなるので、被塗装材の貫通孔の直径を、被塗装面側は小さく、裏面側を大きくすることが容易に行える。また、ピークパワーの大きなパルス波で孔を開けると、仕上がり精度はさらに高まる。

【００１９】そして、貫通孔を開ける時には、被塗装材を水平方向に配置し、被塗装材の下方から開けることにより、貫通孔を開ける際に生じる不用物は、その自重により孔から落ちて、孔内や被塗装面に付着したりするのを防ぐ。かかる不用物とは、たとえば、レーザ照射で金属に未貫通の孔を開ける時にできる溶融金属と酸化物の混合物で、ドロスと呼ばれるものがあり、これは、塗膜の付着や外観に悪影響を及ぼすものである。

【００２０】ここで、レーザ装置を被塗装材のレーザ照射する位置の真下には配置せず、貫通孔を、被塗装材の下斜め方向からのレーザ照射により開けると、落下する

ドロス等により、レーザ装置を傷付けることもなく、また、貫通孔は、被塗装材を斜めに貫通するので、アンカー効果は、さらに増大する。これらの、本発明の作用は、被塗装材が金属板であるときに、特に、特徴的である。

【００２１】

【実施例】以下に、本発明を図面に示す実施例に基づいて説明する。図１及び図２は、この発明を適用した第一の実施例を示しており、図１は、レーザ照射により貫通孔を開ける方法の概要を示す被塗装材の断面図、図２は、塗装下地処理方法を施した後の被塗装材に塗装を行った塗装体の断面図である。

【００２２】図中１は、被塗装材であり、本実施例では建物の外壁に用いる厚さ２ｍｍのアルミニウムパネルからなる金属板を用いる。そして、被塗装材１に後述の塗装下地処理を施した後に、塗料を塗る被塗装材１の一方の面を被塗装面１ａとし、被塗装面１ａの裏側を裏面１ｂとする。また、図中２は、被塗装材１に貫通孔を開ける時のレーザの照射範囲を示し、図中２ａは、レーザビームの焦点である。本実施例では、レーザとして、炭酸ガスレーザを用いるが、他のレーザを用いることができるのは、勿論である。

【００２３】次に、被塗装材１についての塗装下地処理方法を述べる。レーザの照射の条件は、出力は１．０ｋＷとし、レーザビームの焦点２ａは被塗装材１の被塗装面１ａから２．０ｍｍ前方とし、レーザ照射時間は０．５秒とする。かかるレーザを、被塗装材１の被塗装面１ａ側から被塗装面１ａ上の多数の箇所に照射して、被塗装材１に、被塗装面１ａでは直径０．３ｍｍ、裏面１ｂでは直径０．４５ｍｍである貫通孔３を多数開ける。その後、被塗装材１の表面を洗浄して、塗装下地処理を完了する。

【００２４】そして、塗装下地処理後の被塗装材１に、その被塗装面１ａでの塗膜４の膜厚は０．３ｍｍであり、その塗膜４から貫通孔３内には塗膜アンカー部４ａが入り込んで嵌結するように、通常の方法でフッ素樹脂加工用の塗装焼き付けを行い、塗装体５とする。これにより、被塗装材１と塗膜４との付着性に優れた塗装体５が得られる。

【００２５】次に、第二の実施例を、図３及び図４により説明する。図３は、レーザの照射方向を示す被塗装材の断面図、図４は、塗装体の断面図である。塗装下地処理を施す被塗装材１は、前記の実施例と同様の金属板である。そして、本実施例の塗装下地処理方法では、被塗装材１を水平方向に配置し、被塗装面１ａが下面となるようにする。そして、前記の実施例と同様の条件で、ピークパワーの大きなパルス波のレーザを、図３に示すように、被塗装材１の下斜め方向から照射して孔を開ける。

【００２６】このようにして、図４に示すように、被塗装材１に斜めに貫通した貫通孔３を多数の開けた後に、前記実施例と同様に表面を洗浄して塗装下地処理を完了し、かかる被塗装材１に前記同様の塗装を行って塗装体５とする。本実施例によれば、金属板である被塗装材１にレーザを照射することにより生じるドロス６は、その自重で被塗装材１の表面上や孔から落ちるため、被塗装材１にドロス６が付着して、被塗装材１と塗膜４との付着性や塗装体５の外観に悪影響が及ぶことがなくなる。また、レーザ装置は、落下してくるドロス６により傷が付くこともない。そして、塗膜アンカー部４ａの形状により、被塗装材１と塗膜４との付着性は、さらに良くなる。また、ピークパワーの大きなパルス波で孔を開けるので仕上がり精度が高い塗装下地処理方法となる。

【００２７】なお、図１～図４は、各実施例をわかりやすくするために、各部の大きさの比率は、実際のものとは変えて描いたものである。また、本発明は、これらの実施例にとらわれることなく、種々の態様で実施できるのは勿論である。

【００２８】

【発明の効果】本発明によれば、被塗装材に直径０．１～０．５ｍｍの貫通孔を多数開けたことにより、被塗装材の熱膨張または被塗装材の曲げ加工による歪みは、貫通孔の部分で吸収され、アンカー効果により被塗装材と塗膜との付着力も増した。したがって、被塗装材の折り曲げ加工後もきれいな塗装仕上がりが得られ、複雑な形状の加工も可能となった。さらに、被塗装材の軽量化の問題や意匠性を損なうことなく、優れた付着力と耐候性を発揮する塗装体を得られるようになった。

【００２９】そして、貫通孔の直径を、被塗装面側は小さく、裏面側を大きくしたことにより、アンカー効果はより顕著なものとなり、被塗装材と塗膜との付着力は、さらに増大した。次に、被塗装材に、０．１～０．５ｍｍという小さな貫通孔を開ける方法として、レーザを照射したことにより、容易かつ精度良く貫通孔を開けることができた。そして、レーザビームの焦点の調整により、貫通孔の直径を、被塗装面側とその裏面側とで大きさを変えることが可能となった。

【００３０】また、レーザビームの焦点を、被塗装材の被塗装面の近傍に位置させたことにより、金属板の貫通孔の直径を、被塗装面側は小さく、裏面側を大きくすることも容易かつ精度良く行えた。そして、被塗装材を水平方向に配置し、貫通孔を、被塗装材の下方から開けたことにより、貫通孔を開ける際に生じる不用物による、被塗装材と塗膜との付着性や塗装体の外観への悪影響を防止することができた。

【００３１】ここで、貫通孔を、被塗装材の下斜め方向からのレーザ照射により開けたことにより、レーザ装置を保護し、また、貫通孔によるアンカー効果を、さらに増大することができた。これらの、本発明の効果は、被塗装材が金属板であるときに、特に、優れたものなる。

7　　8

【図面の簡単な説明】

【図１】第一の実施例の被塗装材の断面図である。

【図２】第一の実施例の塗装体の断面図である。

【図３】第二の実施例の被塗装材の断面図である。

【図４】第二の実施例の塗装体の断面図である。

【符号の説明】

1　被塗装材

＊1a　被塗装面

1b　裏面

2a　レーザビームの焦点

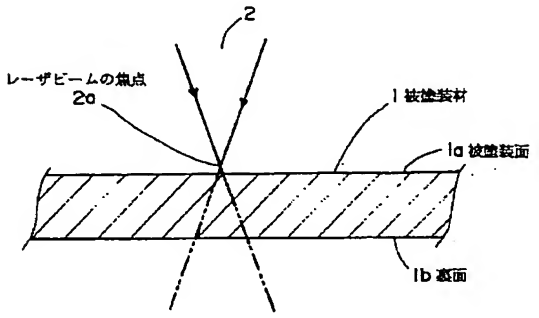
3　貫通孔

4　塗膜

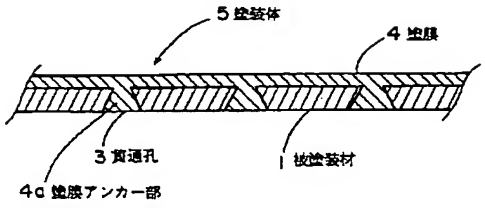
4a　塗膜アンカー部

＊5　塗装体

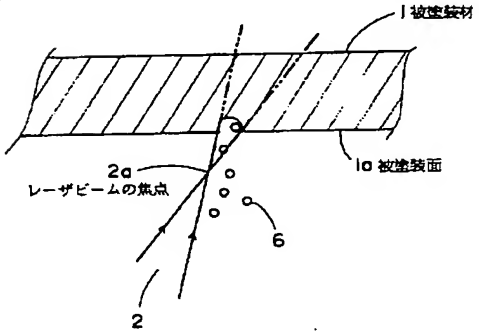
【図１】



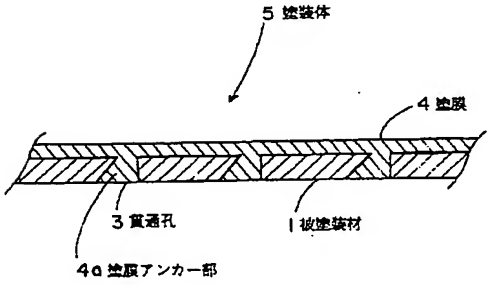
【図２】



【図３】



【図４】



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The paint surface treatment approach characterized by preceding painting and opening many through tubes with a diameter of 0.1-0.5mm in painted material.
[Claim 2] The paint surface treatment approach characterized by making the diameter in the rear face larger than a diameter [in / for said through tube / the painted surface-ed of said painted material] in the paint surface treatment approach according to claim 1.
[Claim 3] It is the paint surface treatment approach characterized by for said through tube irradiating laser in the paint surface treatment approach according to claim 1 or 2, and opening.
[Claim 4] The paint surface treatment approach characterized by arranging the painted surface-ed of said painted material horizontally, and opening said through tube from the lower part of painted material in claim 1 and the paint surface treatment approach according to claim 2 or 3.
[Claim 5] The paint surface treatment approach characterized by arranging the painted surface-ed of said painted material horizontally, and opening said through tube by the laser radiation from the bottom slant of painted material in the paint surface treatment approach according to claim 1 or 2.
[Claim 6] The paint surface treatment approach characterized by adjusting the focus of a laser beam and changing the diameter of said through tube with the painted surface-ed and rear face of painted material in claim 3 and the paint surface treatment approach according to claim 4 or 5.
[Claim 7] The paint surface treatment approach characterized by using a metal plate for said painted material in claim 1, claim 2, claim 3, claim 4, and the paint surface treatment approach according to claim 5 or 6.
[Claim 8] Painted material characterized by preparing the through tube of a large number with a diameter of 0.1-0.5mm.
[Claim 9] It is the painted material characterized by the diameter in the rear face being larger than a diameter [in / on painted material according to claim 8 and / in said through tube / the painted surface-ed of said painted material].
[Claim 10] It is the painted material characterized by said painted material being a metal plate in painted material according to claim 8 or 9.
[Claim 11] The paint object which consists of the painted material which prepared the through tube of a large number with a diameter of 0.1-0.5mm, a paint film which carried out stratification on this, and the paint film support section which entered and ****(ed) in said through tube from said paint film.
[Claim 12] It is the paint object characterized by the diameter in the rear face being larger than a diameter [in / on a paint object according to claim 11 and / in said through tube / the painted surface-ed of said painted material].
[Claim 13] It is the paint object characterized by said painted material being a metal plate in a paint object according to claim 11 or 12.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the paint surface treatment approach, painted material, and a paint object, and relates to the paint surface treatment approach which raises the adhesion of painted material and a paint film, the painted material which performed this processing, and the paint object which painted to the painted material by performing surface treatment to painted material especially.
[0002]
[Description of the Prior Art] For example, metal plates, such as the aluminum quality of the material and quality of iron steel materials, are painted material currently used in the large range, such as sheathing of the outer wall of a building, a roof, or an automobile. And paint of the front face of this metal plate was further performed through many strokes of undercoat, a second coat, and glazing, after cleaning by removing a part for the fats and oils which has adhered on the surface of a metal plate as surface treatment.
[0003] And the physical method of using power tools which carry out acceleration injection of the still more nearly granular abrasives as the surface treatment in the metal plate used for sheathing, and are thrown at a painted surface-ed, such as blasting and a disc sander (polish foil), Or by the chemical approach of applying a pro oxidant to a painted surface-ed, by giving irregularity to the painted surface-ed, the surface area of a painted surface-ed was increased, and the guide peg of a paint film gave the loan, and the adhesion of the paint film to painted material was increased.
[0004]
[Problem(s) to be Solved by the Invention] However, when the paint object which applied the coating to the front face of the metal plate which performed said surface treatment was used as sheathing of a building, by the repeat of the severe heat conditions by the sun, the difference in the coefficient of thermal expansion of a metal plate and the resin which is a coating became a cause, the paint film blistered and the exfoliation had arisen.
[0005] Moreover, distortion arose in painted material by the thermal expansion by the sun, the image reflected in the front face of a paint object was made distorted, and there was a problem of the contraction sound of the painted material which was expanding occurring in the evening. This is remarkable when painted material is a metal plate. And in batten-seam-roofing ****** represented in a metal foof, since the bending part was pulled, it was easy to produce exfoliation of a paint film. On the other hand, in the metal plate used as sheathing of an automobile, there was a problem that lightweight-ization for it being necessary not only to raise design nature, but there being a problem on which a paint film exfoliates in bending processing in the production stroke of an automobile, and raising the effectiveness of fuel consumption also had to be attained.
[0006] Furthermore, in the seashore district, since the adhesion of a metal plate and a coating was not enough, the problem of being easy to generate rust by adhesion of salinity had arisen. Moreover, except for the problem of rust, such a problem is assumed, also when using for painted material, other materials, for example, plastics material.

[0007]
[Means for Solving the Problem] In order to solve said technical problem, this invention is strong and offers the painted material, paint object, and the paint surface treatment approach of excelling in weatherability. That is, as indicated to claim 1, this invention precedes painting and relates to the paint surface treatment approach characterized by opening many through tubes with a diameter of 0.1-0.5mm in painted material.
[0008] In addition, having set to 0.1-0.5mm the diameter of the through tube opened in painted material is based on the reason explained below. In a hole with a diameter of 0.3mm or less, it is hard to produce leak in the roof of a building. Moreover, if the general paint as a sheathing material is carried out to the painted material which the 0.5mm through tube is opening, the diameter of the through tube after paint will be set to 0.3mm or less. Therefore, even if 0.5mm or less, then a through tube are not closed by the paint film in the magnitude of the through tube opened in painted material, leak in the roof is not produced. On the other hand, if the diameter of the through tube before paint is smaller than 0.1mm, the operation effectiveness of the through tube to the paint film mentioned later will not arise.
[0009] Here, as indicated to claim 2, if characterized by enlarging the diameter in the rear face, it is more effective than a diameter [in / for said through tube / the painted surface-ed of said painted material]. Moreover, as indicated to claim 3, if characterized by irradiating laser and opening it, case [whose painted material is / like a metal plate], it is suitable [said through tube] as an approach of opening a through tube.
[0010] As laser, carbon dioxide gas laser, an YAG laser, or excimer laser is suitable, for example. And if it is the paint surface treatment approach characterized by arranging the painted surface-ed of said painted material horizontally, and opening said through tube from the lower part of painted material as indicated to claim 4, it is still more suitable as an approach of opening a through tube.
[0011] Furthermore, it will become a more suitable approach, if the painted surface-ed of said painted material is arranged horizontally and said through tube is opened by the laser radiation from the bottom slant of painted material, as indicated to claim 5. Moreover, what is necessary is to adjust the focus of a laser beam, to locate the focus of a laser beam near the front face of painted material, and just to irradiate it like claim 6, as the paint surface treatment approach characterized by changing the diameter of said through tube with the painted surface-ed and rear face of painted material, when opening a through tube which irradiates laser and was indicated to claim 2.
[0012] These paint surface treatment approaches are the optimal, if it is characterized by using a metal plate for said painted material as indicated to claim 7. And by giving these paint surface treatment approaches to painted material, as indicated to claim 8, it becomes the painted material characterized by preparing the through tube of a large number with a diameter of 0.1-0.5mm.
[0013] Moreover, as indicated to claim 9, said through tube can also be made into the painted material characterized by the diameter in the rear face being larger than the diameter in the painted surface-ed of said painted material. Furthermore, as indicated to claim 10, said painted material also turns into painted material characterized by being a metal plate.
[0014] Subsequently, by painting these painted material, as indicated to claim 11, it becomes the paint object which consists of the paint film support section which entered and ****(ed) in said through tube from the painted material which prepared the through tube of a large number with a diameter of 0.1-0.5mm, the paint film which carried out stratification on this, and said paint film. Moreover, as indicated to claim 12, said through tube can also be used as the paint object characterized by the diameter in the rear face being larger than the diameter in the painted surface-ed of said painted material.
[0015] Furthermore, as indicated to claim 13, said painted material also becomes the paint object characterized by being a metal plate.
[0016]
[Function] Although adhesion is secured by association with chemical painted material and paint film of a paint object, like this invention, by opening a through tube with a diameter of 0.1-0.5mm

in painted material, the through tube of painted material is filled up with a coating, and it carries out desiccation solidification and, in the usual case, becomes with the paint film on a painted surface-ed, and the paint film support section of one. And by this paint film support section, also physically it joins together and it not only combines painted material and a paint film chemically, but unifies them.

[0017] Moreover, the distortion by the thermal expansion of painted material or bending of painted material is absorbed in the part of a through tube by opening many above through tubes in painted material. And a painted surface-ed side is small in the diameter of a through tube, and the paint film support section of escaping easily in this through tube is lost by enlarging a rear-face side. next, the thing for which laser is irradiated as an approach of opening a small through tube called the diameter of 0.1-0.5mm in painted material -- for example, also when making a hard metal plate into painted material, it becomes easy to open the through tube of desired magnitude. And the diameter of a through tube can be adjusted with a precision sufficient [also changing magnitude by its painted surface-ed and rear-face side] by adjusting the focus of a laser beam.

[0018] And if the focus of a laser beam is located near the painted surface-ed of painted material, since the hole through which laser pierces will become so large that it goes previously by the same principle as the time of a bullet breaking through an object, a painted surface-ed side is small in the diameter of the through tube of painted material, and it can perform enlarging a rear-face side easily. Moreover, if a hole is opened by the big pulse wave of peak power, result precision will increase further.

[0019] and the unnecessary object produced in case a through tube is opened by arranging painted material horizontally and opening from the lower part of painted material when opening a through tube -- the self-weight -- from a hole -- falling -- a hole -- it prevents adhering to inside or a painted surface-ed. There are some which this unnecessary object is the mixture of molten metal and an oxide made when opening a non-penetrated hole in a metal by laser radiation, and are called dross, and this has a bad influence on adhesion and the appearance of a paint film.

[0020] Here, if it does not arrange just under the location where painted material carries out laser radiation of the laser equipment but a through tube is opened by the laser radiation from the bottom slant of painted material, since a through tube will penetrate painted material aslant by the falling dross, without damaging laser equipment, an anchor effect increases further. The operation of these this inventions is characteristic especially, when painted material is a metal plate.

[0021]

[Example] Below, this invention is explained based on the example shown in a drawing. The sectional view of painted material in which drawing 1 and drawing 2 showing the first example which applied this invention, and showing the outline of the approach drawing 1 opens a through tube by laser radiation, and drawing 2 are the sectional views of the paint object which painted to the painted material after giving the paint surface treatment approach.

[0022] One in drawing is painted material and the metal plate which consists of an aluminum panel with a thickness of 2mm used for the outer wall of a building is used for it by this example. And after performing the below-mentioned paint surface treatment to the painted material 1, one field of the painted material 1 which paints is set to painted surface-ed 1a, and the background of painted surface-ed 1a is set to rear-face 1b. Moreover, two in drawing shows the exposure range of the laser when opening a through tube in the painted material 1, and 2in drawing a is the focus of a laser beam. At this example, as laser, although carbon dioxide gas laser is used, of course, other laser can be used.

[0023] Next, the paint surface treatment approach about the painted material 1 is described. The conditions of an exposure of laser set an output to 1.0kW, focal 2a of a laser beam considers as 2.0mm front from painted surface-ed 1a of the painted material 1, and laser radiation time amount is made into 0.5 seconds. This laser is irradiated from the painted surface-ed 1a side of the painted material 1 in many parts on painted surface-ed 1a, and many through tubes 3 which are the diameters of 0.45mm are opened in the painted material 1 by the diameter of 0.3mm, and

rear-face 1b at painted surface-ed 1a. Then, the front face of the painted material 1 is washed and paint surface treatment is completed.

[0024] And the thickness of the paint film 4 in the painted surface-ed 1a is 0.3mm, performs paint baking for fluororesin processing by the usual approach, and is taken as the paint object 5 at the painted material 1 after paint surface treatment so that paint film support section 4a may enter in a through tube 3 and it may **** from the paint film 4. Thereby, the paint object 5 excellent in the adhesion of the painted material 1 and a paint film 4 is acquired.

[0025] Next, drawing 3 and drawing 4 explain the second example. The sectional view of painted material in which drawing 3 shows the direction of radiation of laser, and drawing 4 are the sectional views of a paint object. The painted material 1 which performs paint surface treatment is the same metal plate as the aforementioned example. And the painted material 1 is arranged horizontally and it is made for painted surface-ed 1a to become an inferior surface of tongue by the paint surface treatment approach of this example. And on the same conditions as the aforementioned example, the laser of the big pulse wave of peak power is irradiated from the bottom slant of the painted material 1, as shown in drawing 3 , and a hole is opened.

[0026] Thus, as shown in drawing 4 , a front face is washed for the through tube 3 aslant penetrated to the painted material 1 like said example after many open beams, paint surface treatment is completed, said same paint is performed to this painted material 1, and it considers as the paint object 5. According to this example, in order to fall from the front-face top of the painted material 1, or a hole by the self-weight, it is lost that dross 6 adheres to the painted material 1, and a bad influence attains to the adhesion of the painted material 1 and a paint film 4 and the appearance of the paint object 5 of the dross 6 produced by irradiating laser at the painted material 1 which is a metal plate. Moreover, a blemish is not attached by the dross 6 to which laser equipment falls. And the adhesion of the painted material 1 and a paint film 4 becomes still better with the configuration of paint film support section 4a. Moreover, since a hole is opened by the big pulse wave of peak power, it is finished, and precision serves as the high paint surface treatment approach.

[0027] In addition, drawing 1 - drawing 4 change and draw the ratio of the magnitude of each part with an actual thing, in order to make each example intelligible. Moreover, this invention of the ability to carry out in various modes is natural, without being caught by these examples.

[0028]

[Effect of the Invention] According to this invention, by having opened many through tubes with a diameter of 0.1-0.5mm in painted material, the distortion by the thermal expansion of painted material or bending of painted material was absorbed in the part of a through tube, and also increased the adhesion force of painted material and a paint film according to the anchor effect. Therefore, the beautiful paint result was obtained and processing of a complicated configuration even of after bending processing of painted material was also attained. Furthermore, the paint object which demonstrates the outstanding adhesion force and weatherability could be acquired, without spoiling the problem and design nature of lightweight-izing of painted material.

[0029] And the painted surface-ed side was small in the diameter of a through tube, by having enlarged the rear-face side, the anchor effect became more remarkable and the adhesion force of painted material and a paint film increased further. Next, the through tube was able to be opened with an easily and sufficient precision by having irradiated laser as an approach of opening the small through tube of 0.1-0.5mm in painted material. And adjustment of the focus of a laser beam enabled the diameter of a through tube to change magnitude by its painted surface-ed and rear-face side.

[0030] Moreover, it was able to carry out with a precision easily [a painted surface-ed side is small in the diameter of the through tube of a metal plate, and / also enlarging a rear-face side], and sufficient by having located the focus of a laser beam near the painted surface-ed of painted material. And the bad influence to the adhesion of the painted material and paint film by the unnecessary object produced in case a through tube is opened, or the appearance of a paint object was able to be prevented by having arranged painted material horizontally and having opened the through tube from the lower part of painted material.

[0031] Here, by having opened the through tube by the laser radiation from the bottom slant of

painted material, laser equipment was able to be protected and the anchor effect by the through tube was able to be increased further. the effectiveness of these this inventions was excellent especially, when painted material was a metal plate -- it becomes.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view of the painted material of the first example.
[Drawing 2] It is the sectional view of the paint object of the first example.
[Drawing 3] It is the sectional view of the painted material of the second example.
[Drawing 4] It is the sectional view of the paint object of the second example.
[Description of Notations]
1 Painted Material
1a A painted surface-ed
1b Rear face
2a The focus of a laser beam
3 Through Tube
4 Paint Film
4a Paint film support section
5 Paint Object

[Translation done.]